(ECE) ELECTRONICS AND COMMUNICATION ENGINEERING

INSTRUCTIONS TO CANDIDATES

1. Candidates should write their Hall Ticket Number only in the space provided at the top left hand corner of this page, on the leaflet attached to this booklet and also in the space provided on the OMR Response Sheet. **BESIDES WRITING, THE CANDIDATE SHOULD ENSURE THAT THE APPROPRIATE CIRCLES PROVIDED FOR THE HALL TICKET NUMBERS ARE SHADED USING H.B. PENCIL ONLY ON THE OMR RESPONSE SHEET. DO NOT WRITE HALL TICKET NUMBER ANY WHERE ELSE.**
2. Immediately on opening this Question Paper Booklet, check:
   (a) Whether **200** multiple choice questions are printed (**50** questions in Mathematics, **25** questions in Physics, **25** questions in Chemistry and **100** questions in Engineering)
   (b) In case of any discrepancy immediately exchange the Question paper Booklet of same code by bringing the error to the notice of invigilator.
3. Use of Calculators, Mathematical Tables and Log books is not permitted.
4. **Candidate must ensure that he/she has received the Correct Question Booklet, corresponding to his/her branch of Engineering.**
5. **Candidate should ensure that the booklet Code and the Booklet Serial Number, as it appears on this page is entered at the appropriate place on the OMR Response Sheet by shading the appropriate circles provided therein using H.B. pencil only. Candidate should note that if they fail to enter the Booklet Serial Number and the Booklet Code on the OMR Response Sheet, their Answer Sheet will not be valued.**
6. **Candidate shall shade one of the circles 1, 2, 3 or 4 corresponding question on the OMR Response Sheet using H.B. Pencil only. Candidate should note that their OMR Response Sheet will be invalidated if the circles against the question are shaded using Black / Blue ink pen / Ball pen / any other pencil other than H.B. Pencil or if more than one circle is shaded against any question.**
7. One mark will be awarded for every correct answer. **There are no negative marks.**
8. The OMR Response Sheet will not be valued if the candidate :
   (a) Writes the Hall Ticket Number in any part of the OMR Response Sheet except in the space provided for the purpose.
   (b) Writes any irrelevant matter including religious symbols, words, prayers or any communication whatsoever in any part of the OMR Response Sheet.
   (c) Adopts any other malpractice.
9. Rough work should be done only in the space provided in the Question Paper Booklet.
10. No loose sheets or papers will be allowed in the examination hall.
11. Timings of Test: 10.00 A.M. to 1.00 P.M.
12. Candidate should ensure that he / she enters his / her name and appends signature on the Question paper booklet, leaflet attached to this question paper booklet and also on the OMR Response Sheet in the space provided. Candidate should ensure that the invigilator puts his signature on this question paper booklet, leaflet attached to the question paper booklet and also on the OMR Response Sheet.
13. Before leaving the examination hall candidate should **return both the OMR Response Sheet and the leaflet attached to this question paper booklet** to the invigilator. Failure to return any of the above shall be construed as malpractice in the examination. **Question paper booklet may be retained by the candidate.**
14. This booklet contains a total of **32** pages including Cover page and the pages for Rough Work.

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Note: *(1) Answer **all** questions.*
(2) Each question carries 1 mark. There are no negative marks.
(3) Answer to the questions must be entered only on OMR Response Sheet provided separately by completely shading with H.B. Pencil, only one of the circles 1, 2, 3 or 4 provided against each question, and which is most appropriate to the question.
(4) The OMR Response Sheet will be invalidated if the circle is shaded using ink / ball pen or if more than one circle is shaded against each question.

MATHEMATICS

1. If $A=\begin{bmatrix}3&0&0\\0&3&0\\0&0&3\end{bmatrix}$, then $A^4=$

(1) 3I (2) 9I (3) 27I (4) 81I

2. If $A=\begin{bmatrix}0&2&1\\-2&0&-2\\-1&x&0\end{bmatrix}$ is a skew symmetric matrix, then the value of x is

(1) 1 (2) 2 (3) 3 (4) 4

3. What is the number of all possible matrices with each entry as 0 or 1 if the order of matrices is 3×3

(1) 64 (2) 268 (3) 512 (4) 256

4. If $A=\begin{bmatrix}1&i&-i\\i&-i&1\\-i&1&i\end{bmatrix}$, then $|A|=$

(1) 1 (2) 2 (3) 3 (4) 4

5. The solution of a system of linear equations $2x-y+3z=9, x+y+z=6, x-y+z=2$ is

(1) $x=-1, y=-2, z=-3$ (2) $x=3, y=2, z=1$

(3) $x=2, y=1, z=3$ (4) $x=1, y=2, z=3$

6. If $\frac{1}{x^2+a^2}=\frac{A}{x+ai}+\frac{B}{x-ai}$ then A = _____, B = _____.

(1) $\frac{1}{2ai}, -\frac{1}{2ai}$ (2) $-\frac{1}{2ai}, \frac{1}{2ai}$ (3) $\frac{1}{ai}, -\frac{1}{ai}$ (4) $-\frac{1}{ai}, \frac{1}{ai}$

7. If $\frac{2x+4}{(x-1)^3}=\frac{A_1}{(x-1)}+\frac{A_2}{(x-1)^2}+\frac{A_3}{(x-1)^3}$ then $\sum_{i=1}^{3} A_i$ is equal to

(1) A_2 (2) $2A_2$ (3) $4A_2$ (4) $4A_1$

8. The period of the function $f(x) = |\sin x|$ is

(1) π (2) 2π (3) 3π (4) 4π

9. If A+B=45°, then (1−cotA) . (1−cotB) is

(1) 1 (2) 0 (3) 2 (4) −1

10. The value of sin 78° + cos 132° is

(1) $\frac{\sqrt{5}+1}{4}$ (2) $\frac{\sqrt{5}+1}{2}$ (3) $\frac{\sqrt{5}-1}{2}$ (4) $\frac{\sqrt{5}-1}{4}$

11. If A+B+C = π, then sin2A + sin2B + sin2C =

(1) 4 cosA sinB cosC (2) 4 sinA cosB sinC

(3) 4 cosA cosB cosC (4) 4 sinA sinB sinC

12. The principal solution of Tanx = 0 is

(1) $x = n\pi, n\in Z$ (2) $x=0$

(3) $x=(2n+1)\,\pi/2, n\in Z$ (4) $x = n\pi+\alpha, n\in Z$

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13. The value of $\text{Tan}^{-1}(2) + \text{Tan}^{-1}(3)$ is

(1) $\frac{\pi}{4}$ (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{3}$ (4) $\frac{3\pi}{4}$

14. If the sides of a right angle triangle are in A.P., then the ratio of its sides is

(1) 1:2:3 (2) 2:3:4 (3) 3:4:5 (4) 4:5:6

15. The value of $r.r_1.r_2.r_3$ is

(1) Δ^2 (2) Δ^{-2} (3) Δ^{-3} (4) Δ^4

16. $\frac{1}{r1}+\frac{1}{r2}+\frac{1}{r3}=$

(1) $\frac{1}{r}$ (2) $\frac{1}{2r}$ (3) $\frac{1}{R}$ (4) $\frac{1}{\Delta}$

17. If $a=6$, $b=5$, $c=9$, then the value of angle A is

(1) $\cos^{-1}(2/9)$ (2) $\cos^{-1}(2/5)$ (3) $\cos^{-1}(7/9)$ (4) $\cos^{-1}(1/3)$

18. The polar form of complex number $1-i$ is

(1) $\sqrt{2}e^{-i\pi/4}$ (2) $\sqrt{2}e^{i\pi/4}$ (3) $\sqrt{2}e^{i\pi/2}$ (4) $\sqrt{2}e^{-i\pi/2}$

19. If 1, ω, ω^2 be the cube roots of unity, then the value of $2^{\omega^3}.2^{\omega^5}.2^{\omega}$ is

(1) ω (2) ω^2 (3) 1 (4) 0

20. The intercept made on X-axis by the circle $x^2+y^2+2gx+2fy+c=0$ is

(1) $\sqrt{g^2-c}$ (2) $\sqrt{f^2-c}$ (3) $2.\sqrt{g^2-c}$ (4) $2.\sqrt{f^2-c}$

21. If one end of the diameter of the circle $x^2+y^2-5x-8y+13=0$ is (2, 7), then the other end of the diameter is

(1) (3, 1) (2) (1, 3) (3) (–3, –1) (4) (–1, –3)

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22. The radius of the circle $\sqrt{1+m^2}(x^2+y^2)-2cx-2mcy=0$ is
(1) $2c$ (2) $4c$ (3) $c/2$ (4) c

23. The parametric equations of the ellipse $\frac{x^2}{a^2}+\frac{y^2}{b^2}=1$ are
(1) $x=a\sec\theta, y=b\tan\theta$ (2) $x=b\sin\theta, y=a\cos\theta$
(3) $x=a\cos\theta, y=b\sin\theta$ (4) $x=a\operatorname{cosec}\theta, y=b\cot\theta$

24. The equation of the directrix of the parabola $2x^2=-7y$ is
(1) $8y+7=0$ (2) $8y-7=0$ (3) $7y+8=0$ (4) $8x-7=0$

25. The condition for a straight line $y=mx+c$ to be a tangent to the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$ is
(1) $c=a/m$ (2) $c^2=a^2m^2-b^2$ (3) $c^2=a^2m^2+b^2$ (4) $c^2=a/m$

26. $\underset{x\to 1}{Lt}\ \frac{\sqrt{5x-4}-\sqrt{x}}{x-1}$ is
(1) 3 (2) 2 (3) 4 (4) 1

27. $\log i =$
(1) $\pi/2$ (2) $\pi/4$ (3) $i\pi/2$ (4) $i\pi/4$

28. $\frac{d}{dx}[\log_7 X]=$
(1) $\frac{1}{x}$ (2) $X\log_7^e$ (3) $\frac{1}{x}\log_e^7$ (4) $\frac{1}{x}\log_7^e$

29. $\frac{d}{dx}[2\cosh x]=$
(1) $\frac{e^x+e^{-x}}{2}$ (2) $\frac{e^x-e^{-x}}{2}$ (3) e^x+e^{-x} (4) e^x-e^{-x}

30. $\frac{d}{dx}\left[\cos^{-1}\left(\frac{1-x^2}{1+x^2}\right)\right]=$

(1) $\frac{1}{1+x^2}$ (2) $\frac{-1}{1+x^2}$ (3) $\frac{2}{1+x^2}$ (4) $\frac{-2}{1+x^2}$

31. If $x = at^2, y = 2at$, then $\frac{dy}{dx}=$

(1) $\sqrt{\frac{y}{x}}$ (2) $\sqrt{\frac{x}{a}}$ (3) $\sqrt{\frac{a}{x}}$ (4) $\sqrt{\frac{x}{y}}$

32. The derivative of e^x with respect to $\sqrt{x}$ is

(1) $\frac{2\sqrt{x}}{e^x}$ (2) $2\sqrt{x}\,e^x$ (3) $\frac{e^x}{2\sqrt{x}}$ (4) $\sqrt{x}.e^x$

33. The equation of the normal to the curve $y = 5x^4$ at the point (1, 5) is

(1) $x + 20y = 99$ (2) $x + 20y = 101$ (3) $x - 20y = 99$ (4) $x - 20y = 101$

34. The angle between the curves $y^2 = 4x$ and $x^2 + y^2 = 5$ is

(1) $\frac{\pi}{4}$ (2) $\tan^{-1}(2)$ (3) $\tan^{-1}(3)$ (4) $\tan^{-1}(4)$

35. If $u = x^3y^3$ then $\frac{\partial^3 u}{\partial x^3}+\frac{\partial^3 u}{\partial y^3}=$

(1) $6\,(x^3+y^3)$ (2) $6\,x^3\,y^3$ (3) $6x^3$ (4) $6y^3$

36. $\int \text{cosec}\, x\, dx=$

(1) $\log(\text{cosec}\, x + \cot x) + C$ (2) $\log(\cot x/2) + C$
(3) $\log(\tan x/2) + C$ (4) $-\text{cosec}\, x.\cot x + C$

37. $\int_0^{\frac{\pi}{2}} \cos^{11} x \, dx =$

(1) $\frac{256}{693}$ (2) $\frac{256\pi}{693}$ (3) $\frac{\pi}{4}$ (4) $\frac{128}{693}$

38. $\int f'(x).[f(x)]^n \, dx =$

(1) $\frac{[f(x)]^{n-1}}{n-1}+C$ (2) $\frac{[f(x)]^{n+1}}{n+1}+C$ (3) $n[f(x)]^{n-1}+C$ (4) $(n+1)[f(x)]^{n+1}+C$

39. $\int \frac{dx}{(x+7)\sqrt{x+6}} =$

(1) $Tan^{-1}(\sqrt{x+6})+C$ (2) $2Tan^{-1}(\sqrt{x+6})+C$

(3) $Tan^{-1}(x+7)+C$ (4) $2Tan^{-1}(x+7)+C$

40. $\int \tan^{-1} x \, dx =$

(1) $x.Tan^{-1}x+\frac{1}{2}\log(1+x^2)+C$ (2) $\frac{1}{1+x^2}+C$

(3) $x^2.Tan^{-1}x+C$ (4) $x.Tan^{-1}x-\log\sqrt{1+x^2}+C$

41. $\int \frac{dx}{1+e^{-x}} =$

(1) $\log(1+e^{-x})+C$ (2) $\log(1+e^{x})+C$

(3) $e^{-x}+C$ (4) $e^{x}+C$

42. $\int_{\frac{-\pi}{2}}^{\frac{\pi}{2}} \sin|x| \, dx =$

(1) 0 (2) 1 (3) 2 (4) -1

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43. Area under the curve $f(x) = \sin x$ in $[0, \pi]$ is
(1) 4 sq. units (2) 2 sq. units (3) 6 sq. units (4) 8 sq. units

44. The order of $x^3\frac{d^3y}{dx^3} + 2x^2\frac{d^2y}{dx^2} - 3y = x$ is
(1) 1 (2) 4 (3) 3 (4) 2

45. The degree of $\left[\frac{d^2y}{dx^2} + \left(\frac{dy}{dx}\right)^2\right]^{\frac{3}{2}} = a\frac{d^2y}{dx^2}$ is
(1) 4 (2) 2 (3) 1 (4) 3

46. The family of straight lines passing through the origin is represented by the differential equation
(1) $ydx + xdy = 0$ (2) $xdy - ydx = 0$ (3) $xdx + ydy = 0$ (4) $xdx - ydy = 0$

47. The differential equitation $\frac{dy}{dx} + \frac{ax + hy + g}{hx + by + f} = 0$ is called
(1) Homogeneous (2) Exact (3) Linear (4) Legender

48. The solution of differential equation $\frac{dy}{dx} = e^{-x^2} - 2xy$ is
(1) $y.e^{-x^2} = x + c$ (2) $ye^x = x + c$ (3) $ye^{x^2} = x + c$ (4) $y = x + c$

49. The complementary function of $(D^3+D^2+D+1)\,y = 10$ is
(1) $C_1\cos x + C_2\sin x + C_3e^{-x}$ (2) $C_1\cos x + C_2\sin x + C_3e^x$
(3) $C_1 + C_2\cos x + C_3\sin x$ (4) $(C_1 + C_2x + C_3x^2)\,e^x$

50. Particular Integral of $(D-1)^4y = e^x$ is
(1) x^4e^x (2) $\frac{x^4}{24}e^{-x}$ (3) $\frac{x^4}{12}e^x$ (4) $\frac{x^4}{24}e^x$

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PHYSICS

51. Two quantities A and B are related by the relation A/B = m where m is linear mass density and A force. The dimensions of B will be
(1) same as that of latent heat (2) same as that of pressure
(3) same as that of work (4) same as that of momentum

52. The dimensional formula of capacitance in terms of M, L, T and I is
(1) $[ML^2T^2I^2]$ (2) $[ML^{-2}T^4I^2]$ (3) $[M^{-1}L^3T^3I]$ (4) $[M^{-1}L^{-2}T^4I^2]$

53. If l, m and n are the direction cosines of a vector, then
(1) $l+m+n=1$ (2) $l^2+m^2+n^2=1$ (3) $\frac{1}{l}+\frac{1}{m}+\frac{1}{n}=1$ (4) $lmn=1$

54. The angle between i+j and j+k is
(1) 0° (2) 90° (3) 45° (4) 60°

55. A particle is moving eastwards with a velocity of 5 ms^{-1}. In 10 seconds the velocity changes to 5 ms^{-1} northwards. The average acceleration in this time is
(1) $\frac{1}{\sqrt{2}}$ ms^{-2} towards north-west (2) zero
(3) $\frac{1}{2}$ ms^{-2} towards north (4) $\frac{1}{\sqrt{2}}$ ms^{-2} towards north-east

56. The linear momentum of a particle varies with time t as $p=a+bt+ct^2$ which of the following is correct?
(1) Force varies with time in a quadratic manner.
(2) Force is time-dependent.
(3) The velocity of the particle is proportional to time.
(4) The displacement of the particle is proportional to t.

57. A shell of mass m moving with a velocity v suddenly explodes into two pieces. One part of mass $m/4$ remains stationary. The velocity of the other part is
(1) v (2) $2v$ (3) $3v/4$ (4) $4v/3$

58. The velocity of a freely falling body after 2s is
(1) 9.8 ms^{-1} (2) 10.2 ms^{-1} (3) 18.6 ms^{-1} (4) 19.6 ms^{-1}

59. A large number of bullets are fired in all directions with the same speed u. The maximum area on the ground on which these bullets will spread is

(1) $\frac{\pi u^2}{g^2}$ (2) $\frac{\pi u^4}{g^2}$ (3) $\frac{\pi u^2}{g^4}$ (4) $\frac{\pi u}{g^4}$

60. The minimum stopping distance for a car of mass m, moving with a speed v along a level road, if the coefficient of friction between the tyres and the road is μ, will be

(1) $\frac{v^2}{2\mu g}$ (2) $\frac{v^2}{\mu g}$ (3) $\frac{v^2}{4\mu g}$ (4) $\frac{v}{2\mu g}$

61. When a bicycle is in motion, the force of friction excreted by the ground on the two wheels is such that it acts
(1) In the backward direction on the front wheel and in the forward direction on the rear wheel
(2) In the forward direction on the front wheel and in the backward direction on the rear wheel
(3) In the backward direction on both the front and the rear wheels
(4) In the forward direction on both the front and the rear wheels

62. In a perfectly inelastic collision, the two bodies
(1) strike and explode (2) explode without striking
(3) implode and explode (4) combine and move together

63. Under the action of a constant force, a particle is experiencing a constant acceleration, then the power is
(1) zero (2) positive
(3) negative (4) increasing uniformly with time

64. Consider the following two statements:

A: Linear momentum of a system of particles is zero.

B: Kinetic energy of a system of particles is zero.

Then

(1) A implies B & B implies A (2) A does not imply B & B does not imply A

(3) A implies B but B does not imply A (4) A does not imply B but B implies A

65. An engine develops 10 kW of power. How much time will it take to lift a mass of 200 kg to a height of 40 m? (Given $g = 10\ ms^{-2}$)

(1) 4s (2) 5s (3) 8s (4) 10s

66. If a spring has time period T, and is cut into n equal parts, then the time period will be

(1) $T\sqrt{n}$ (2) $\frac{T}{\sqrt{n}}$ (3) nT (4) T

67. When temperature increases, the frequency of a tuning fork

(1) increases

(2) decreases

(3) remains same

(4) increases or decreases depending on the materials

68. If a simple harmonic motion is represented by $\frac{d^2x}{dy^2}+\alpha x=0$, its time period is

(1) $2\pi\sqrt{\alpha}$ (2) $2\pi\alpha$ (3) $\frac{2\pi}{\sqrt{\alpha}}$ (4) $\frac{2\pi}{\alpha}$

69. A cinema hall has volume of 7500 m^3. It is required to have reverberation time of 1.5 seconds. The total absorption in the hall should be

(1) 850 w-m^2 (2) 82.50 w-m^2 (3) 8.250 w-m^2 (4) 0.825 w-m^2

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70. To absorb the sound in a hall which of the following are used
(1) Glasses, stores
(2) Carpets, curtains
(3) Polished surfaces
(4) Platforms

71. If N represents avagadro's number, then the number of molecules in 6 gm of hydrogen at NTP is
(1) 2N (2) 3N (3) N (4) N/6

72. The mean translational kinetic energy of a perfect gas molecule at the temperature T K is
(1) $\frac{1}{2}kT$ (2) kT (3) $\frac{3}{2}kT$ (4) $2kT$

73. The amount of heat given to a body which raises its temperature by 1°C
(1) water equivalent
(2) thermal heat capacity
(3) specific heat
(4) temperature gradient

74. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio Cp/Cv for gas is
(1) $\frac{3}{2}$ (2) $\frac{4}{3}$ (3) 2 (4) $\frac{5}{3}$

75. Cladding in the optical fiber is mainly used to
(1) to protect the fiber from mechanical stresses
(2) to protect the fiber from corrosion
(3) to protect the fiber from mechanical strength
(4) to protect the fiber from electromagnetic guidance

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CHEMISTRY

76. The valency electronic configuration of Phosphorous atom (At.No. 15) is
(1) $3s^2\ 3p^3$ (2) $3s^1\ 3p^3\ 3d^1$ (3) $3s^2\ 3p^2\ 3d^1$ (4) $3s^1\ 3p^2\ 3d^2$

77. An element 'A' of At.No.12 combines with an element 'B' of At.No.17. The compound formed is
(1) covalent AB (2) ionic AB_2 (3) covalent AB_2 (4) ionic AB

78. The number of neutrons present in the atom of $_{56}Ba^{137}$ is
(1) 56 (2) 137 (3) 193 (4) 81

79. Hydrogen bonding in water molecule is responsible for
(1) decrease in its freezing point (2) increase in its degree of ionization
(3) increase in its boiling point (4) decrease in its boiling point

80. In the HCl molecule, the bonding between hydrogen and chlorine is
(1) purely covalent (2) purely ionic (3) polar covalent (4) complex coordinate

81. Potassium metal and potassium ions
(1) both react with water (2) have the same number of protons
(3) both react with chlorine gas (4) have the same electronic configuration

82. 5.85 gms of sodium chloride were dissolved in water and the solution made upto 100 ml in a standard flask. 10 ml of this solution were pipetted out into another flask and made up with distilled water into 100 ml of solution. The concentration of the sodium chloride solution now is
(1) 0.1 M (2) 1.0 M (3) 0.5 M (4) 0.25 M

83. Concentration of a 1.0 M solution of phosphoric acid in water is
(1) 0.33 N (2) 1.0 N (3) 2.0 N (4) 3.0 N

84. Which of the following is a Lewis acid?
(1) Ammonia (2) Berylium chloride
(3) Boron trifluoride (4) Magnesium oxide

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85. Which of the following constitutes the components of a buffer solution?
(1) Potassium chloride and potassium hydroxide
(2) Sodium acetate and acetic acid
(3) Magnesium sulphate and sulphuric acid
(4) Calcium chloride and calcium acetate

86. Which of the following is an electrolyte?
(1) Acetic acid (2) Glucose (3) Urea (4) Pyridine

87. Calculate the Standard emf of the cell, $Cd/Cd^{+2}//Cu^{+2}/Cu$ given that $E^0\ Cd/Cd^{+2} = 0.44V$ and $E^0\ Cu/Cu^{+2} = (-)\ 0.34\ V$.
(1) (–) 1.0 V (2) 1.0 V (3) (–) 0.78 V (4) 0.78 V

88. A solution of nickel chloride was electrolysed using Platinum electrodes. After electrolysis,
(1) nickel will be deposited on the anode (2) Cl_2 gas will be liberated at the cathode
(3) H_2 gas will be liberated at the anode (4) nickel will be deposited on the cathode

89. Which of the following metals will undergo oxidation fastest?
(1) Cu (2) Li (3) Zinc (4) Iron

90. Which of the following cannot be used for the sterilization of drinking water?
(1) Ozone (2) Calcium Oxychloride
(3) Potassium Chloride (4) Chlorine water

91. A water sample showed it to contain 1.20 mg/litre of magnesium sulphate. Then, its hardness in terms of calcium carbonate equivalent is
(1) 1.0 ppm (2) 1.20 ppm (3) 0.60 ppm (4) 2.40 ppm

92. Soda used in the L-S process for softening of water is, Chemically.
(1) sodium bicarbonate (2) sodium carbonate decahydrate
(3) sodium carbonate (4) sodium hydroxide (40%)

93. The process of cementation with zinc powder is known as
(1) sherardizing (2) zincing (3) metal cladding (4) electroplating

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94. Carrosion of a metal is fastest in
(1) rain-water (2) acidulated water (3) distilled water (4) de-ionised water

95. Which of the following is a thermoset polymer?
(1) Polystyrene (2) PVC
(3) Polythene (4) Urea-formaldehyde resin

96. Chemically, neoprene is
(1) polyvinyl benzene (2) polyacetylene
(3) polychloroprene (4) poly-1,3-butadiene

97. Vulcanization involves heating of raw rubber with
(1) selenium element (2) elemental sulphur
(3) a mixture of Se and elemental sulphur (4) a mixture of selenium and sulphur dioxide

98. Petrol largely contains
(1) a mixture of unsaturated hydrocarbons C_5 - C_8
(2) a mixture of benzene, toluene and xylene
(3) a mixture of saturated hydrocarbons C_{12} - C_{14}
(4) a mixture of saturated hydrocarbons C_6 - C_8

99. Which of the following gases is largely responsible for acid-rain?
(1) SO_2 & NO_2 (2) CO_2 & water vapour
(3) CO_2 & N_2 (4) N_2 & CO_2

100. BOD stands for
(1) Biogenetic Oxygen Demand (2) Biometric Oxygen Demand
(3) Biological Oxygen Demand (4) Biospecific Oxygen Demand

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ELECTRONICS AND COMMUNICATION ENGINEERING

101. In a pn junction diode, if the junction current is zero, this means that
(1) there is no carriers crossing the junction.
(2) the number of majority carriers crossing the junction equals the number of minority carriers crossing the junction.
(3) the number of holes diffusing from the p-region equals the number of electrons diffusing from the n-region.
(4) the potential barrier has disappeared.

102. The circuit shown in Fig.1 acts as
(1) clamper
(2) rectifier
(3) comparator
(4) clipper

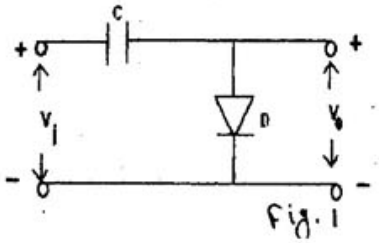

Fig. 1

103. The emitter region in the pnp junction transistor is more heavily doped than the base region so that
(1) base current will be high
(2) the flow across the base region will be mainly because of electrons
(3) recombinations will be increased in the base region
(4) the flow across the base region will be mainly because of holes

104. A field-effect transistor (FET)
(1) depends on minority-carrier flow
(2) uses high concentration emitter junction
(3) has a very high input resistance
(4) uses forward-biased pn junction

105. In a half wave rectifier, the load current flows for
(1) only for positive half cycle of input signal
(2) the complete cycle of the input signal
(3) more than half cycle but less than the complete cycle of input signal
(4) less than half cycle of input signal

106. A transistor is said to be in a quiescent state when
(1) no currents are flowing
(2) emitter-junction bias is just equal to collector-junction bias
(3) no signal is applied to the input
(4) it is unbiased

107. Compared to CB amplifier, the CE amplifier has
(1) higher current amplification
(2) lower input resistance
(3) higher output resistance
(4) lower current amplification

108. The negative output swing starts clipping first when Q-point
(1) is near saturation point
(2) is near cut-off point
(3) has optimum value
(4) is in the active region of the load line

109. Introducing a resistor in the emitter of CE amplifier stabilizes the dc operating point against variations in
(1) only the β of the transistor
(2) both temperature and β
(3) only the temperature
(4) neither β nor temperature

110. Which of the following class of amplifiers has highest among of distortion?
(1) class C (2) class AB (3) class B (4) class A

111. Tuned voltage amplifiers are not used
(1) in radio receivers
(2) where a band of frequencies is to be selected and amplified
(3) in television receivers
(4) in a public-address systems

112. Feedback in a amplifier always helps to
(1) increase its gain
(2) stabilize its gain
(3) decrease its input impedance
(4) control its output

113. An ideal OP-AMP has
(1) infinite input resistance and infinite output resistance
(2) infinite input resistance and zero output resistance
(3) zero input resistance and infinite output resistance
(4) zero input resistance and zero output resistance

114. For square wave generation _____ is used.
(1) bistable multivibrator (2) schmitt trigger
(3) astable multivibrator (4) monostable multivibrator

115. Pulse width of a collector coupled monostable multivibrator is given by
(1) T = 0.69 RC (2) T = 0.707 RC (3) T = 1.69 RC (4) T = 1.38 RC

116. In series resonance circuit, increasing inductance to twice its value and reducing capacitance to half its value.
(1) will change the maximum value of current
(2) will change the resonance frequency
(3) will increase the selectivity of the circuit
(4) will change the impedance at resonance frequency

117. A high Q coil has
(1) low losses (2) flat response
(3) high losses (4) large bandwidth

118. Superposition theorem is based on the concept of
(1) duality (2) reciprocity (3) linearity (4) non-linearity

119. In the Thevenin equivalent circuit, V_{th} equals
(1) short-circuit terminal voltage (2) open-circuit terminal voltage
(3) net voltage available in the circuit (4) voltage of the source

120. An independent voltage source in series with an impedance $Z_S = R_S + jX_S$ delivers a maximum average power to a load impedance Z_L when
(1) $Z_L = R_S$ (2) $Z_L = jX_S$ (3) $Z_L = R_S + jX_S$ (4) $Z_L = R_S - jX_S$

121. The minimum standing waves occur where reflection coefficient is
(1) zero (2) unity (3) -1 (4) ∞

122. Impedance matching over wider-frequency range can be obtained
(1) singl stub (2) double stub
(3) quarter wave transformer (4) balun

123. A lossless line will be distortionless if the phase shift
(1) is constant with frequency (2) varies inversely with frequency
(3) varies directly with frequency (4) has nothing to do with distortion on a lossless line

124. Which of the following methods can be used for measuring power without using wattmeter?
(1) one voltmeter, one ammeter (2) two voltmeters, two ammeters
(3) three voltmeters (4) three ammeters

125. When large currents are to be measured using DC ammeter, the major part of the current is bypassed through a
(1) capacitor (2) resistor (3) inductor (4) diode

126. The shunt-type ohmmeter is suited to the measurement of
(1) high-value resistance
(2) medium-value resistance
(3) both medium and high-value resistance
(4) low-value resistance

127. Digital instruments are preferred to other indicating instruments because of
(1) narrow bandwidth (2) better accuracy
(3) cost (4) better resolution

128. Without a spectrum analyzer, it is not possible to determine
(1) modulating frequency (2) antenna pattern
(3) pulse width (4) spurious signal strength and its location

129. The Q-meter is used to measure the electrical properties of
(1) resistors only (2) inductors only
(3) coils and capacitors (4) capacitors only

130. The deflection sensitivity of a CRT depends inversely on the
(1) separation between Y plates (2) length of the vertical deflecting plates
(3) deflecting voltage (4) distance between screen and deflecting plates

131. The CRO is used to measure
(1) power of the signal (2) time period of the signal only
(3) amplitude and time period of the signal (4) spectral components of the signal

132. Audio frequency oscillators, operating roughly in the
(1) 0 Hz to 20 Hz (2) 1 Hz to 1-MHz
(3) 1 KHz to 1000 KHz (4) 20 Hz to 20 KHz

133. A non-triggered oscilloscope is one which
(1) has no sweep generator
(2) can not produce a stable stationary screen display
(3) has a continuously running time-base generator
(4) can display a portion of the input signal waveform

134. After firing an SCR, the gating pulse is removed. The current in the SCR will
(1) immediately fall to zero (2) rise a little and then fall to zero
(3) rise up (4) remain the same

135. A TRIAC can be triggered into conduction by
(1) only positive voltage at either anode
(2) positive or negative voltage at gate
(3) positive or negative voltage at gate and positive or negative voltage at either anode
(4) only negative voltage at either anode

136. An SCR conducts appreciable current when
(1) anode is negative and gate is positive with respect to cathode
(2) gate is negative and anode is positive with respect to cathode
(3) anode and gate are both positive with respect to cathode
(4) anode and gate both negative with respect to cathode

137. In a thyristor, the ratio of holding current to latching current is
(1) 0.4 (2) 2.5 (3) 1.0 (4) 4.0

138. In a 3-phase full converter, the output voltage pulsates at a frequency equal to
(1) supply frequency f (2) 3f
(3) 6f (4) 2f

139. In BJT, the relation between α and β is
(1) $\beta = \frac{\alpha}{(\alpha+1)}$ (2) $\beta = \frac{\alpha}{(\alpha-1)}$ (3) $\alpha = \frac{\beta}{(\beta+1)}$ (4) $\alpha = \frac{(\beta+1)}{\beta}$

140. In three-phase 180° mode bridge inverter, the lowest order harmonic in the line to neutral output voltage (fundamental frequency output = 50 Hz) is
(1) 100 Hz (2) 150 Hz (3) 250 Hz (4) 200 Hz

141. A single phase full bridge diode rectifier delivers a load current of 10A, which is ripple free. Average and RMS values of diode currents are respectively.
(1) 10A, 7.07A (2) 5A, 7.07A
(3) 7.07A, 5A (4) 5A, 10A

142. Resonant mode power supplies in comparison to square mode ones
(1) have smaller component count (2) do not cause over voltages
(3) have negligible power loss (4) slower in control action

143. A delta-connected induction motor being fed by a 3-phase AC to DC inverter and operated in constant V/f control mode requires during starting a
(1) star-delta starter (2) no starter requires
(3) auto-transfer starter (4) direct online starter

144. The message signal contains three frequencies 2 KHz, 5 KHz and 10 KHz respectively. The bandwidth of the AM signal is
(1) 20 KHz (2) 5 KHz (3) 2 KHz (4) 10 KHz

145. A carrier is simultaneously modulated by two sine waves with modulation indices of 0.3 and 0.4; the resultant modulation index is
(1) 0.7 (2) 0.4 (3) 0.3 (4) 0.5

146. Indicate which one of the following is not advantage of FM over AM.
(1) lower bandwidth is required (2) better noise immunity is provided
(3) less modulating power is required (4) the transmitted power is more useful

147. In a low-level AM system, amplifiers following the modulated stage must be
(1) harmonic devices (2) nonlinear devices
(3) linear devices (4) class C amplifier

148. A_c and A_m are peak amplitudes of carrier and modulating signal respectively. When $A_c = A_m$
(1) modulation index is 100% (2) modulation index is zero
(3) modulation index falls below 100% (4) modulation index is above 100%

149. In a SSB transmitter, one is most likely to find a
(1) class C audio amplifier (2) class A R.F. output amplifier
(3) class B R.F. amplifier (4) tuned modulator

150. A superheterodyne receiver with an I.F. of 450 KHz is tuned to a signal at 1200 KHz. The image frequency is
(1) 750 KHz (2) 900 KHz (3) 1650 KHz (4) 2100 KHz

151. In a radio receiver with simple AGC
(1) an increase in signal strength produces more AGC
(2) the faster the AGC time constant, the more accurate the output
(3) the highest AGC voltage is produced between stations
(4) the audio stage gain is normally controlled by the AGC

152. To prevent overloading of the last I.F. amplifier in a receiver, one should use
(1) double conversion (2) variable selectivity
(3) variable sensitivity (4) squelch

153. One of the main functions of R.F. amplifier in a superheterodyne receiver is to
(1) provide improved tracking
(2) improve the rejection of the image frequency
(3) permit better adjacent-channel rejection
(4) increase the tuning range of the receiver

154. Frequencies in the UHF range propagate by means of
(1) sky waves (2) surface waves (3) ground waves (4) space waves

155. When electromagnetic waves travel in free space only one of the following can happen to the
(1) attenuation (2) reflection (3) refraction (4) absorption

156. In PCM system, the quantization noise depends upon
(1) the sampling rate
(2) both the sampling rate and the number of quantization levels
(3) the Nyquist rate
(4) the number of quantization levels

157. The bit rate of a digital communication system is 36 Mbps, the modulation scheme is QPSK. The baud rate of the system is
(1) 72 Mbps (2) 68 Mbps (3) 36 Mbps (4) 18 Mbps

158. Which multiplexing technique transmits analog signal
(1) FDM (2) WDM (3) TDM (4) both FDM and TDM

159. The standard reference antenna for the directive gain is the
(1) half-wave dipole (2) isotropic antenna
(3) infinitesimal dipole (4) elementary doublet

160. Yagi antenna contains
(1) one reflector and one director (2) dipole, one reflector and one director
(3) two directors, no reflector (4) dipole and two directors

161. The radiation resistance of a Hertizian dipole _____with increase in length of dipole.
(1) increases (2) remains unchanged
(3) attains a maximum and then falls (4) decreases

162. The wavelength of a wave in a waveguide
(1) is directly proportional to the group velocity
(2) is inversely proportional to the phase velocity
(3) is greater than in free space
(4) depends on the wavelength dimensions and the free space wavelength

163. The guide wavelength (λ_g) is related to free space (λ) wavelength and cut-off wavelength (λ_c) as
(1) $\frac{1}{\lambda^2} = \frac{1}{\lambda_c^2} + \frac{1}{\lambda_g^2}$ (2) $\frac{1}{\lambda_g^2} = \frac{1}{\lambda^2} + \frac{1}{\lambda_c^2}$
(3) $\frac{1}{\lambda_c^2} = \frac{1}{\lambda_g^2} + \frac{1}{\lambda^2}$ (4) $\frac{1}{\lambda^2} = \frac{1}{\lambda_c^2} + \frac{1}{\lambda_g^2}$

164. If the peak transmitted power in a radar system is increased by a factor of 16, the maximum range will be increased by a factor of

(1) 8 (2) 4 (3) 2 (4) 16

165. The biggest disadvantage of CW Doppler radar is that

(1) it does give target range, but not position
(2) it does not give the target position
(3) it does not give the target velocity
(4) it does not give the target range

166. Which of the following system is an international system

(1) INSAT (2) ATS-6 (3) MARISAT (4) INTELSAT

167. A typical optical fiber has

(1) high refractive index core and low refractive index cladding
(2) uniform refractive index core surrounded by variable refractive index cladding
(3) variable refractive index core with refractive index increasing from low value at the centre of the core to high value at the junction with the cladding
(4) low refractive index core and high refractive index cladding

168. The GSM standard is

(1) first generation cellular networks (2) second generation cellular networks
(3) third generation cellular networks (4) fourth generation cellular networks

169. The 2's complement of 1000_2 is

(1) 0111 (2) 0001 (3) 1000 (4) 0101

170. Which of the following is not an octal number?

(1) 19 (2) 101 (3) 15 (4) 77

Set Code : T2
Booklet Code : A

171. The complete set of only those logic gates designated as universal gates is
(1) NOT, OR and AND gates (2) XNOR, NOR and NAND gates
(3) NOR and NAND gates (4) XOR, NOR and NAND gates

172. The gates required to build an half-adder are
(1) Ex-OR gate and NOR gate (2) three NAND gates
(3) EX-OR gate and OR gate (4) EX-OR and AND gate

173. Read and write capabilities are available in
(1) Both ROM and RAM (2) RAM
(3) ROM (4) Latch

174. An n-bit ADC using V_R as reference voltage has a resolution (in volts) of
(1) $V_R/2^n$ (2) $V_R.2n$ (3) $V_R/2^{n-1}$ (4) $V_R.n$

175. In a 4-bit weighted-resistor D/A converter, the resistor value corresponding to LSB is 32 kΩ. The resistor value corresponding to MSB will be
(1) 16 kΩ (2) 8 kΩ (3) 4 kΩ (4) 32 kΩ

176. The minimum number of NAND gates required to implement the Boolean function $A + A\overline{B} + A\overline{B}C$ is equal to
(1) 1 (2) 4 (3) zero (4) 7

177. Which of the following ADC is the fastest type of ADC
(1) Dual slope integrator ADC (2) Flash type of ADC
(3) Counter type of ADC (4) Integrator type of ADC

178. When two n-bit binary numbers are added then the sum will contain at the most
(1) (n+2) bits (2) n bits (3) 2n bits (4) (n+1) bits

179. The 8051 microcontroller has
(1) one bus (2) two buses (3) three buses (4) four buses

180. The number of interrupts available in 8051 microcontroller
(1) five (2) six (3) eight (4) three

181. The 8051 is an _____ microcontroller.
(1) 16 bit (2) 32 bit (3) 64 bit (4) 8bit

182. The 8051 microcontroller includes an instruction set of _____ operation codes.
(1) 245 (2) 255 (3) 250 (4) 260

183. The 8051 microcontroller consists of
(1) 256 bytes RAM (2) 512 bytes RAM
(3) 128 bytes RAM (4) 64 bytes RAM

184. The USART accepts data characters from the CPU
(1) in parallel format and then converts them into a continuous serial data stream
(2) in serial format and then converts them into a parallel format data stream
(3) in parallel format and after certain delay transmits as a parallel data stream
(4) in serial format and after certain delay transmits as a serial data stream

185. The peripheral interface controller 8255 has _____ separately accessible ports.
(1) three (2) six (3) two (4) eight

186. The number of operating modes of 8257 DMA controller
(1) 4 (2) 6 (3) 5 (4) 3

187. The number of addressing modes available in 8086 microprocessor
(1) 10 (2) 8 (3) 6 (4) 12

188. The 8086 microprocessor is a
(1) 8-bit processor (2) 16-bit processor
(3) 32-bit processor (4) 64-bit processor

189. A complete television signal consists of
(1) camera signal
(2) sync pulses and a sound signal
(3) a video signal and sync pulses
(4) a composite video signal and sound signal

190. Interlacing is used in TV frames to
(1) avoid flicker
(2) ensure scanning of all lines
(3) produce illusion of motion
(4) ensure scanning of all lines and produce illusion of motion

191. In TV system, equalizing pulses are sent during
(1) horizontal blanking
(2) horizontal retrace
(3) serrations
(4) vertical blanking

192. In TV signals, the colour burst is used to
(1) interface each horizontal line
(2) ensure the I and Q phase correctly
(3) maintain the colour sequence
(4) synchronise colours

193. The resolution of a TV picture is determined by
(1) video bandwidth
(2) video amplification factor
(3) the number of frames scanned
(4) the output of the video detector

194. Attenuation will be more in
(1) multi mode fibers
(2) single mode fibers
(3) multi mode and single mode fibers
(4) single mode fibers of 8 μm core diameters

195. Star topologies are operated in
(1) half duplex mode only
(2) full duplex mode only
(3) simplex mode only
(4) half or full duplex mode

Set Code : T2
Booklet Code : A

196. Datagram switching is done at the
(1) data link layer
(2) network layer
(3) transport layer
(4) physical layer

197. Which of the following reduces the probability of collision
(1) *p*-persistent
(2) *l*-persistent
(3) non-persistent
(4) both *l*-persistent and non-persistent

198. The multiple access technique used in wireless local area network is
(1) CSMA
(2) CSMA/CD
(3) CSMA/CA
(4) CSMA with *l*-persistent

199. X.25 is a
(1) packet switching network
(2) virtual-circuit switching network
(3) circuit switching network
(4) frame relay

200. The ATM standard defines
(1) five layers
(2) four layers
(3) three layers
(4) seven layers